CHAPTER 4. AIRCRAFT NOISE FACTORS

a. Ldn Methodology

The Day-Night Sound Level (Ldn) is a noise descriptor developed under the auspices of the U.S. Environmental Protection Agency (EPA) for use in describing aircraft and other environmental noise impacts. It has been adopted by EPA; it is the index preferred by FAA, which has developed its own program for Ldn calculation; and it is recognized by the U.S. Department of Housing and Urban Development (HUD) as a proper basis for land use planning around airports.

Ldn is a logarithmic average of sound levels in A-weighted decibels (dBA). It is based upon a 24-hour Equivalent Sound Level (Leq) and is weighted to account for increased noise sensitivity between 10:00 p.m. and 7:00 a.m., with a 10 dBA penalty applied to noise events during the nighttime period. The procedure takes into account:

- altitude profiles
- thrust/power schedules
- flight track locations
- number of operations on each flight track
- split of operations between daytime and nighttime hours
- runway utilization schedule
- departure procedures
- touch-and-go, and other special operations.

The FAA's Integrated Noise Model (INM), Version 3.8, was utilized for the calculation of Ldn values. Locations with the same Ldn level are joined by a line or "contour" representing the particular noise level. Contour values usually range from Ldn 60 or 65 for lightly affected areas to more than Ldn 75 for heavily affected areas. The FAA, in conjunction with HUD and other federal agencies, has developed land use compatibility criteria for specific Ldn values. These criteria are discussed in Chapter 7. Ldn may also be used for quantifying other noise sources, such as auto traffic, and for comparing them to airport-generated noise.

Operational Assumptions - Existing Conditions (1984)

Ldn noise contours for the average day's traffic were calculated applying all of the above listed factors for current operations at Deer Valley. The daily operational mix in 1984 used for noise modeling purposes is presented in Tables 4-1 and 4-2.

Figure 4-1 displays the existing typical flight tracks used by aircraft departing and arriving at the Deer Valley Airport. The south runway (7R-25L) is utilized by about 91 percent of the takeoff and 86 percent of the landing operations. Business jets operations are all conducted on this runway.

The north runway (7L-25R) is used mainly for touch-and-go operations by propeller aircraft. Approximately 87 percent of the total touch-and-go operations at the airport are conducted on this runway.

TABLE 4-1

OPERATIONS BY AIRCRAFT CATEGORIES, 1984
DEER VALLEY MUNICIPAL AIRPORT

Aircraft Type	Departures Day	Departures Night	Arrivals Day	Arrivals Night	Touch-and-Go's Day	Touch-and-Go's Night
Single-Engine Piston	111	12	111	12	166	6
Multi-Engine Piston	11	3	11	3	14	1
Turboprop	3	-	3	-	-	-
Business Jet	4	-	4	-	-	-
Helicopter	20	-	20	-	-	-
TOTAL:	149	15	149	15	180	7

TABLE 4-2

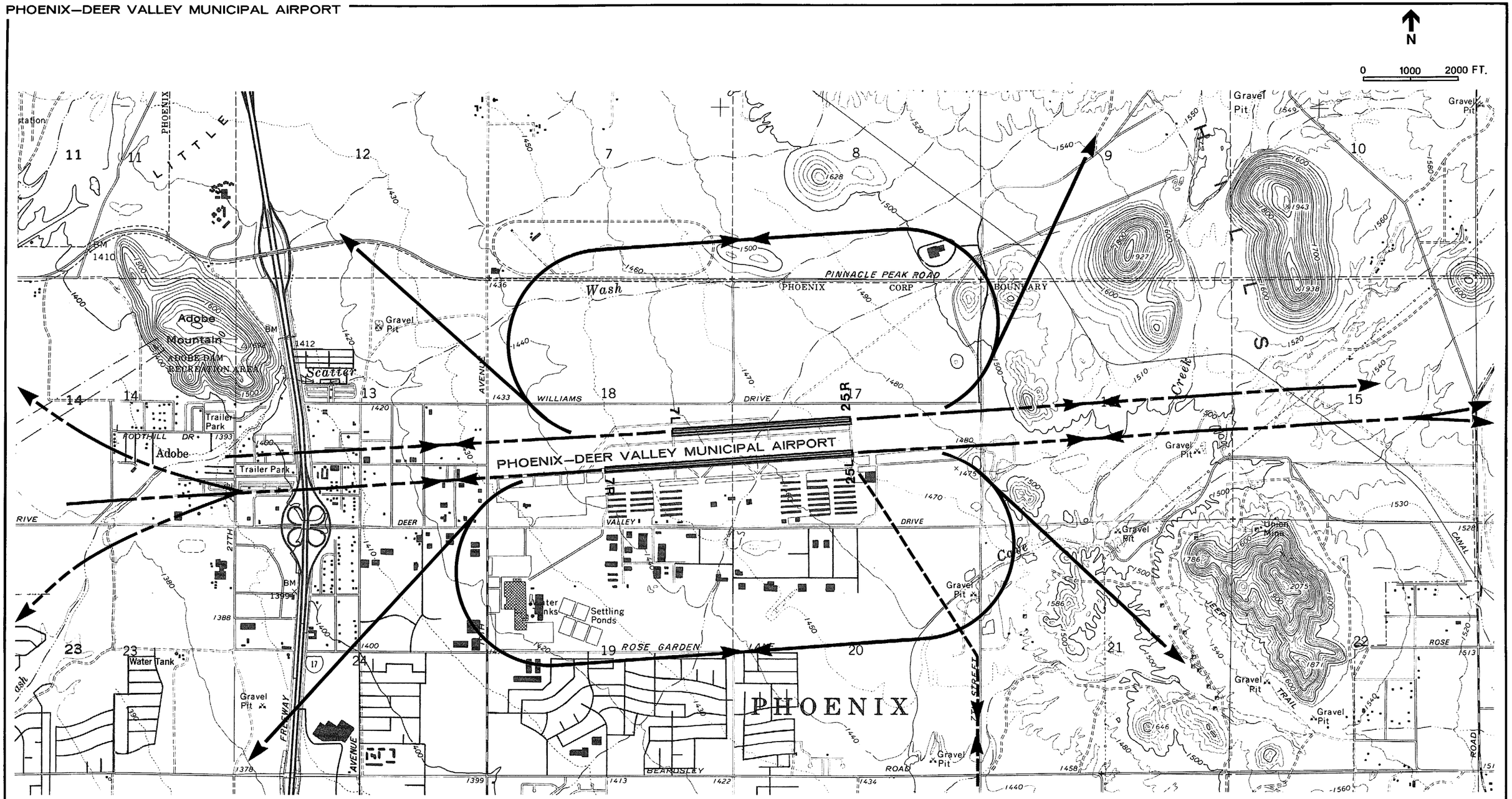
RUNWAY USE 1984
DEER VALLEY MUNICIPAL AIRPORT

Rwy	Takeoffs(%)		Landings(%)		Touch & Go's(%)	
	Prop.	Jets	Prop.	Jets	Prop.	Jets
7L	5	--	10	--	52	--
7R	55	60	50	60	8	--
25L	37	40	37	40	5	--
25R	3	--	3	--	35	--

EXISTING FLIGHT TRACKS

FIGURE 4-1

PHOENIX—DEER VALLEY MUNICIPAL AIRPORT



Business jet operations to the west proceed to just beyond Interstate 17 and then turn on course; departures to the east proceed approximately 2 miles straight out before turning on course.

Helicopter activity on the airport on an average day includes 20 arrivals and 20 departures. Fifty percent of these operations are conducted at the police hangar on the east end of the airport. The noise analysis has taken helicopter operations into consideration.

b. Existing Ldn Noise Contours (1984)

Figure 4-2 shows the existing Deer Valley Airport noise contours. Contour levels of Ldn 65 and Ldn 75 were generated.

The Ldn 65 contour extends approximately 1000 feet away from each end of Runway 7R-25L and 600 feet south of this runway. The contour generated by operations on runway 7L-25R covers a much smaller area than that for 7R-25L (Ldn 65 extends about 500 feet away from each end and 300 feet to the north). The contour is smaller because of the runway's shorter length and unsuitability for operations by business jets. The whole area subjected to Ldn 65 is less than 0.45 square mile.

The area covered by the Ldn 65 contour generally confirms that the noise levels generated are not significant in terms of annoyance to the nearby neighborhood. There is no residential population within the Ldn 65 contour, which falls completely on airport property.

c. Future Ldn Noise Contours (1995)

To analyze the noise impact of the forecasted traffic movements at Deer Valley in the year 1995, future noise contours were generated (Figure 4-3).

It was assumed that Runway 7R-25L would be extended 1400 feet to the east and 1400 feet to the west. It was also assumed that Runway 7L-25R would be extended 700 feet to the west. The above runway extensions were based on a preliminary analysis of airport facility requirements. Traffic levels in 1995 were based on a forecast of 98 percent increase in traffic movements in the year 1995 for single-engine piston aircraft, multi-engine piston aircraft, and helicopters, and a 500 percent increase in activity by business jets.

With the runway extensions and increased business jet activity, the area within the Ldn 65 contour will increase to about 0.9 square miles extending 2600 feet to the east and 2200 feet to the west of Runway 7R-25L. The width of the new contour extends 400 feet north of the north runway and 750 feet south of the main runway. There is no residential population within the 1995 Ldn 65 contour.

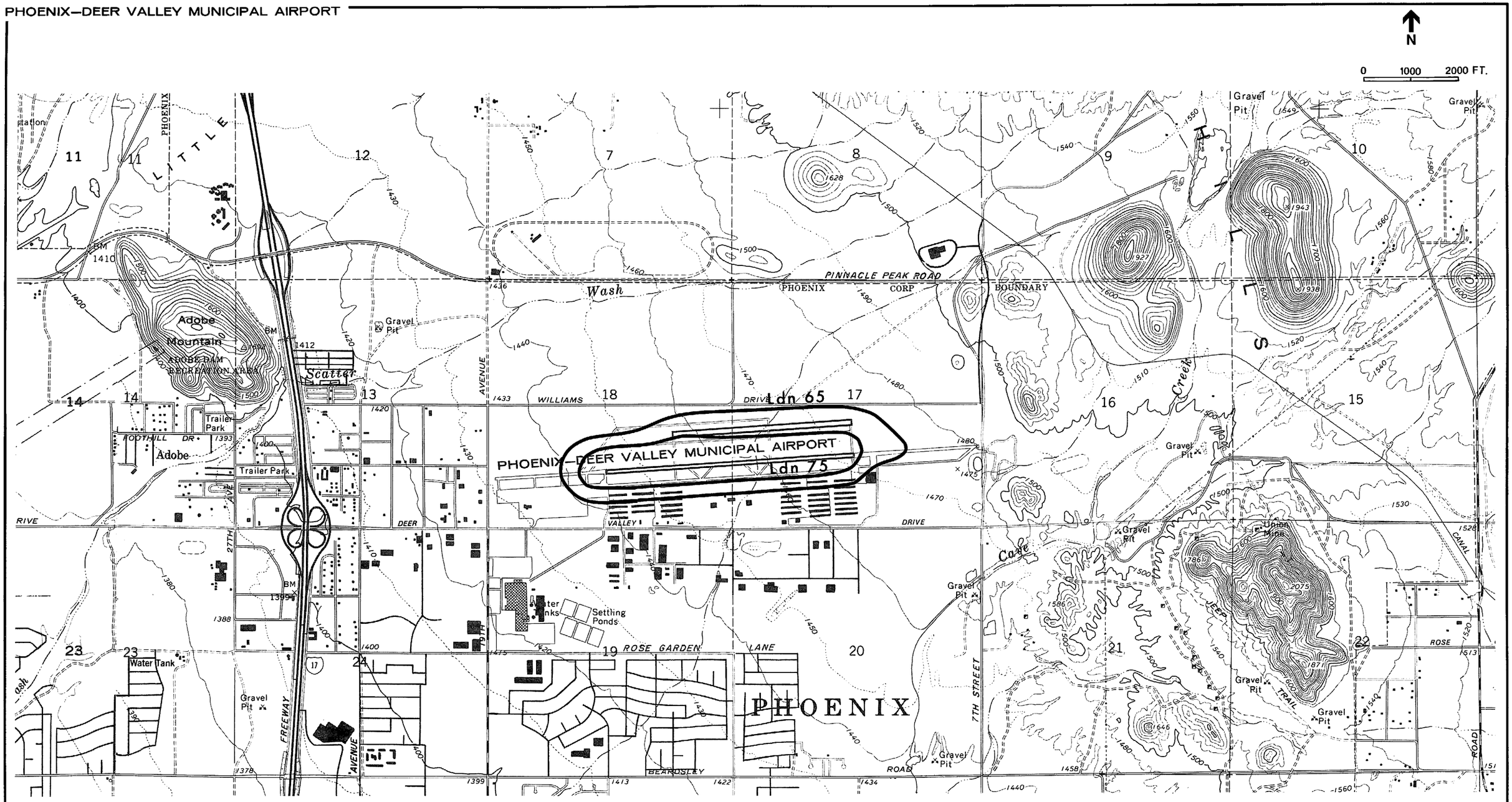
d. Field Noise Measurement Program

Field monitoring of noise levels was conducted in areas adjacent to Deer Valley Airport between November 26 and 29, 1984.

NOISE CONTOURS - 1984

FIGURE 4-2

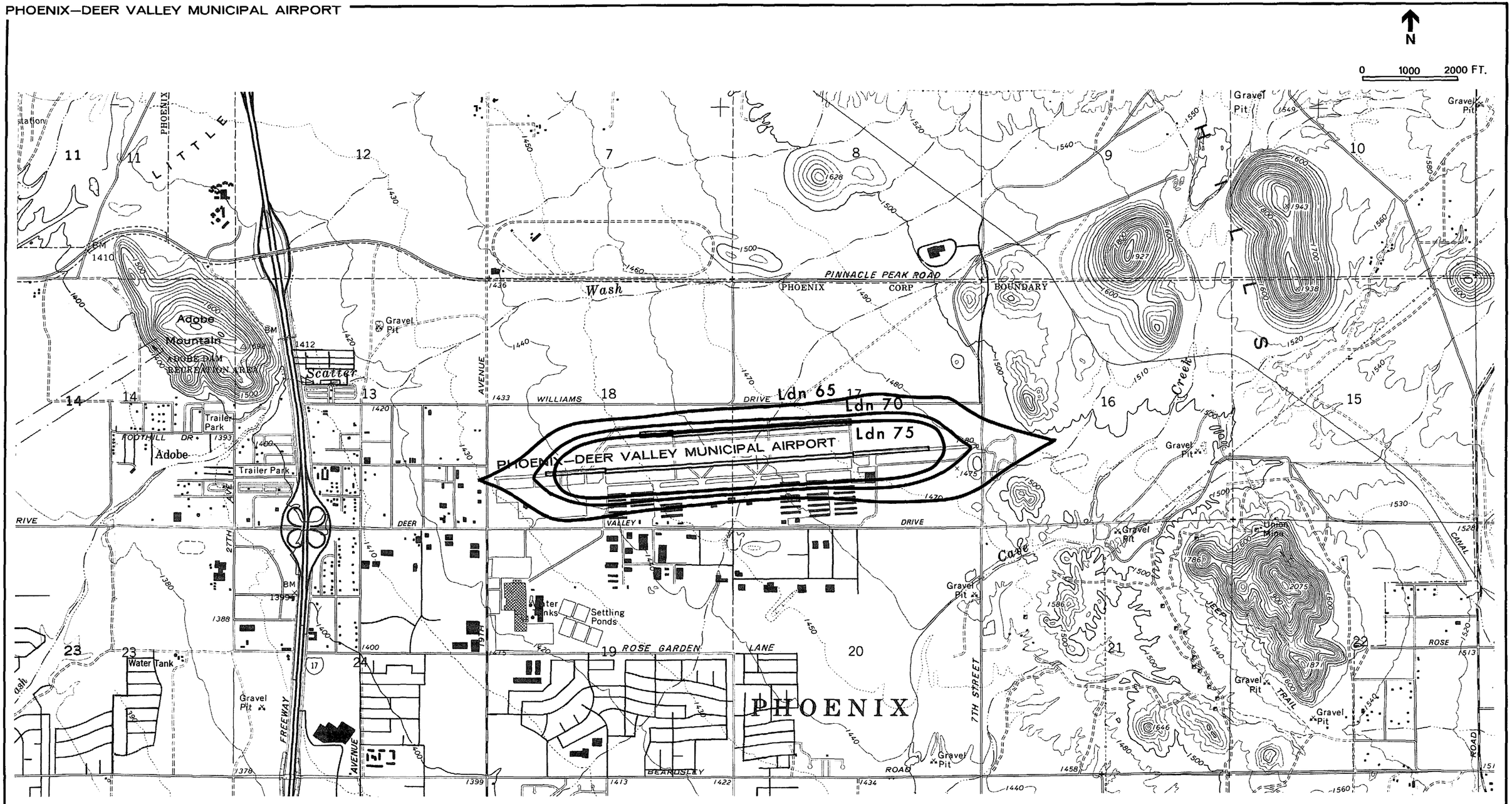
PHOENIX–DEER VALLEY MUNICIPAL AIRPORT



NOISE CONTOURS - 1995

FIGURE 4-3

PHOENIX—DEER VALLEY MUNICIPAL AIRPORT



Five sites in the vicinity of the Airport were monitored for 24 hours each. The sites are shown in Figure 4-4. Observations on the east side were limited to one site due to problems in finding suitable locations where the equipment could be secure. The description of the sites, the monitoring periods and the description of the equipment used at each site is presented in Table 4-3.

Two sets of equipment, as described in Table 4-3, were used in the measurement program. The analyzers processed all of the noise incidents picked up by the microphones. The data was stored and was manually transcribed from the readout to the data sheets. Equipment was checked several times during the day. While sessions were in progress, field notes were made by an engineer on the exact nature of each noise event recorded, including the time, direction, and type of aircraft operations. These field notes were made for a minimum of one hour at each site during that site's 24-hour monitoring period. Field notes are summarized in Table 4-4.

The purpose of the study was to determine the 24-hour day-night sound level (Ldn) at these various locations in the airport vicinity from both aircraft and non-aircraft sources.

Noise levels at Site 1, although located over 500 feet off the road, were nevertheless influenced by traffic noise from 7th Street. Between 9:00 a.m. and 10:00 a.m. on November 27, 1984, readings indicated background noise levels of 48-50 dBA. Noise from traffic produced peaks up to 63 dBA with aircraft producing peaks between 57 and 75 dBA.

Site 2 was located about 200 feet west of 19th Avenue. The site is definitely influenced by traffic noise. During the period between 8:30 a.m. and 9:30 a.m. on November 28, 1984, background noise levels were 50-52 dBA with traffic producing peak noise levels up to 67 dBA. Aircraft peaks ranged from 54 to 63 dBA.

Site 3 was not influenced as much as Sites 1 or 2 from traffic noise. Between 1:00 p.m. and 2:00 p.m. on November 28, 1984, background noise levels were 42-44 dBA. This rose to 51-52 dBA for brief periods when a nearby residential heat pump turned on. Traffic generated peaks up to 62 dBA, but it was light and sporadic. Aircraft activity was minimal during the observation period with only two aircraft producing peak levels of 62 and 70 dBA.

The observation period at Site 4 was between 12:00 p.m. and 12:45 p.m. on November 29, 1984. Background noise levels were 46-50 dBA. Traffic peaks, although sporadic, were up to 64 dBA. Aircraft peaks were substantial with noise levels ranging from 58 to 84 dBA.

The last location, Site 5, had background noise levels of 44-46 dBA during the 10:00 a.m. to 11:00 a.m. monitoring period on November 29, 1984. Traffic noise levels produced peaks up to 59 dBA, although these were infrequent. Aircraft produced peak levels of between 54 and 67 dBA.

NOISE MONITORING LOCATIONS

FIGURE 4-4

PHOENIX–DEER VALLEY MUNICIPAL AIRPORT

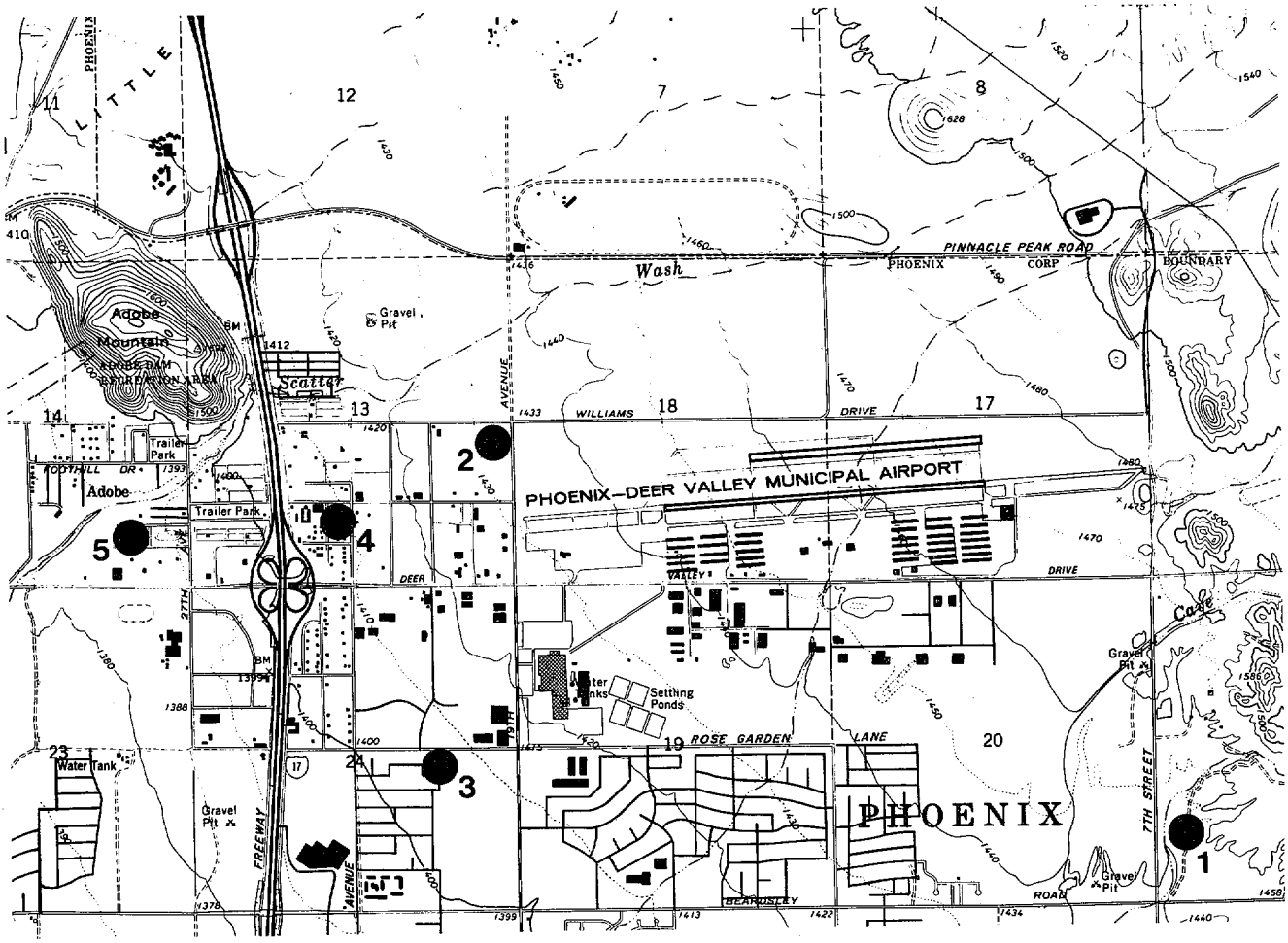


TABLE 4-3

24-HOUR NOISE MONITORING SITES
11/26/84 - 11/29/84
DEER VALLEY MUNICIPAL AIRPORT

Site	Location/Description	Monitoring Period Date	Monitoring Period Time	Equipment Set
1	0.1 mile E. of 7th St. 0.75 mile S. of Deer Valley Rd. - Vacant Land	11/26/84 11//27/84	5:45 p.m. 5:45 p.m.	1
2	SW Corner of Williams Dr. & 19th Ave. - Phoenix Welding Supply Co.	11/27/84 11/28/84	12:20 p.m. 12:20 p.m.	2
3	2101 W. Rose Garden Ln. - Hinkofer Residence	11/27/84 11/28/84	6:25 p.m. 6:25 p.m.	1
4	2313 W. Adobe Dr. - Jenkins Residence	11/28/84 11/29/84	6:55 p.m. 6:55 p.m.	1
5	2837 W. Louise Dr. - Meadows Residence	11/28/84 11/29/84	12:50 p.m. 12:50 p.m.	2

Equipment Set #1 - Metrosonics dB-603 Sound Level Analyzer (SN D00000)
Equipment Set #2 - Metrosonics dB-603 Sound Level Analyzer (SN 1130)

TABLE 4-4

FIELD OBSERVATIONS 11/26/84 - 11/29/84
DEER VALLEY MUNICIPAL AIRPORT

Site	Date	Time	Aircraft(1)	Landing-Takeoff Pattern(2)	Peak Noise Level (dBA)	Notes
1	11/27/84	9:06 a.m.	SEP	TKO	65	
		9:14 a.m.	SEP	TKO	61	3)
		9:20 a.m.	SEP	TKO	59	3)
		9:24 a.m.	SEP	TKO	62	3)
		9:29 a.m.	SEP	FLO	75	
		9:30 a.m.	SEP	TKO	60	3)
		9:35 a.m.	SEP	TKO	57	3)
		9:40 a.m.	SEP	TKO	58	3)
		9:45 a.m.	SEP	TKO	58	3)
		9:46 a.m.	SEP	TKO	66	
		9:50 a.m.	SEP	TKO	57	3)
		9:55 a.m.	SEP	TKO	58	3)
2	11/28/84	8:35 a.m.	SEP	LND	58	3)
		8:40 a.m.	SEP	LND	63	3)
		8:44 a.m.	SEP	LND	62	3)
		8:57 a.m.	SEP	LND	63	3)
		9:03 a.m.	SEP	LND	56	3)
		9:08 a.m.	SEP	LND	60	
		9:09 a.m.	SEP	LND	54	3)
		9:16 a.m.	SEP	LND	54	3)
		9:21 a.m.	SEP	LND	59	3)
3	11/28/84	1:15 p.m.	BJ	TKO	62	
		1:46 p.m.	HC	TKO	70	
4	11/29/84	12:12 p.m.	BJ	TKO	84	
		12:16 p.m.	TEP	TKO	79	
		12:18 p.m.	SEP	TKO	65	
		12:20 p.m.	TEP	TKO	81	
		12:22 p.m.	HC	FLB	68	
		12:26 p.m.	TEP	TKO	83	
		12:35 p.m.	SEP	TKO	60	
		12:40 p.m.	SEP	TKO	58	
		12:44 p.m.	SEP	TKO	69	
5	11/29/84	10:19 a.m.	SEP	LND	54	4)
		10:32 a.m.	SEP	LND	67	
		10:34 a.m.	SEP	FLB	63	
		10:36 a.m.	TEP	FLB	62	
		10:45 a.m.	SEP	LND	60	4)
		10:48 a.m.	TEP	FLB	58	
		10:50 a.m.	SEP	FLB	55	

1) SEP - Single Engine Propeller, TEP - Twin Engine Propeller, BJ - Business Jet, HC - Helicopter.
2) TKO - Takeoff, LND - Landing, FLB - Flyby.
3) One SEP doing touch-and-go.
4) Not directly overhead.

At all sites other than Site 2, peak levels resulting from aircraft overflight exceeded those resulting from auto traffic or other non-aircraft sources. The contribution of aircraft overflight is likely to be a primary determinant of the overall noise levels recorded. The levels recorded are shown in Table 4-5. All of the sites lie outside of the calculated Ldn 65 noise contour for current traffic, and these measured levels are therefore consistent with the calculated values.

TABLE 4-5

24-HOUR MONITORING DATA
DEER VALLEY MUNICIPAL AIRPORT

Site	Measured Ldn
1	60
2	61
3	61
4	61
5	56

Source: HNTB, November 1984

The normal background levels and peak non-aircraft noise levels reported on the previous pages are typical for areas of the character of those surveyed.